REMARKS

In response to the Office Action dated September 9, 2008, claims 1, 2, 12 and 15 have been amended. Claims 1-16 remain active in this application. No new matter has been added. Claims 1 and 15 are independent claims.

The claimed diamond n-type semiconductor (claim 1) is characterized by the feature that its electron concentration exhibits a negative correlation with temperature, in the specific temperature range, and only vapor-phase growth can achieve such a negative correlation with temperature. Claim 15 is a method claim and has been amended similar to that of claim 1. Therefore, the present claims have been amended to clarify that an n-type dopant concentration is adjusted by vapor-phase growth in order to achieve such a negative correlation with temperature.

Claims 1-11 and 13-15 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being incomplete for omitting essential elements (i.e. a second semiconductor layer), with such omission amounting to a gap between the elements. Applicants respectfully traverse.

The subject matter, as defined in claims 1-11, is a diamond n-type semiconductor itself. As can be readily understood from claim 1, since the claimed diamond n-type semiconductor comprises a first diamond semiconductor, it is clear that the properties defined in claims 1-11 substantially mean those of the first diamond semiconductor. Although the property of the diamond n-type semiconductor combined with first and second diamond semiconductors can improve that of the diamond n-type semiconductor comprising only first diamond semiconductor, a specific effect can be obtained even when <u>only</u> the first diamond semiconductor is applied to a device. Note numbered paragraph [0023] at page 10 of the specification wherein the presence of a second semiconductor layer is identified in a separate

embodiment of the present application. Device of claims 13 and 14 are applied with only a first diamond semiconductor and realize a desirable performance. Furthermore, claim 15 defines a method of producing a diamond n-type semiconductor (substantially corresponding to the first diamond semiconductor), and therefore it is free from device operation and claimed properties.

Thus, Applicants submit that claims 1-11 and 13-15 are in compliance with all requirements of 35 U.S.C. § 112. Reconsideration and withdrawal of the rejection are therefore solicited.

Claims 1-7 and 9-13 were rejected under 35 U.S.C. § 102(b) as allegedly anticipated by McClure et al. (U.S. Pat. App. Pub. No. 2004/0149993, hereinafter McClure), or in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over McClure, with "evidentiary support provided by" Clevenger et al. (U.S. Pat. No. 6,579,743) and Davis et al. (U.S. RE34,861). Applicants respectfully traverse the rejection.

McClure relates to a method of using SiC (silicon carbide) and describes a doping technique using ion implantation. In contrast, the present claimed subject matter relates to a semiconductor and method using actual diamond, not silicon carbide, which is a diamond diamond-like material with different material properties from actual diamond. The secondary reference to Clevenger fails to disclose that SiC is actual diamond. In fact, the section in Clevenger referred to by the Examiner clearly differentiates between diamond and diamond-like materials. Thus, the Examiner's reliance on the doctrine of inherency is misplaced in view of the art recognized material property differences between actual diamond and diamond-like simulants such as SiC. Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing <u>may</u> result from a given set of circumstances <u>is not sufficient</u> to establish inherency. *In re Rijckaert*, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993) (reversed rejection

because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 212 USPQ 323, (CCPA 1981). To establish inherency, the extrinsic evidence must make clear that the missing property must necessarily be present in the thing described in the reference. Therefore, the target material of McClure is clearly different from that of the present claimed subject matter and as such the products are not identical. A prima facie case of anticipation or obviousness has not been established. The rejection is not legally viable and should be withdrawn.

Independent claim 15 was rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Yoshida (U.S. Pat. No. 6,340,393, hereinafter "Yoshida"), or in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over Yoshida. Applicants respectfully traverse.

The n type diamond semiconductor of Yoshida has a low resistance n type diamond thin film (as described in column 2, after line 15 of Yoshida) and is not activated due to a deep donor level of 50 meV. Further, Yoshida realized the n type diamond semiconductor by doping p type dopant and n type dopant at the same time. By simultaneously doping n type and p type dopants, the obtained n type diamond semiconductor becomes a single crystalline diamond thin film with a low resistance and high quality in which the n type dopant becomes stable by a high concentration, an impurity level is shallow, and the number of carrier becomes very large. In other words, it is clear that the n type diamond semiconductor of Yoshida exhibits only electron concentration positively correlated with temperature such that the number of carrier increases along with the shallowing of an impurity level. Independent claim 15 requires that the diamond semiconductor has an n-type dopant concentration adjusted by the vapor-phase growth such that an electron concentration of the diamond semiconductor exhibits a negative correlation. Accordingly, the n type diamond semiconductor according to claim 15 requires that the electron

concentration of the diamond semiconductor exhibits a negative correlation, whereas the n type diamond semiconductors of the Yoshida reference exhibit electron concentration positively correlated with temperature. Thus, the rejection is not legally viable since the reference fails to disclose or suggest every limitation of claim 15.

Dependent claim 8 was rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over McClure in view of Ando et al. (JP 2001-007385, hereinafter "Ando"). Applicants respectfully traverse.

Dependent claim 14 was rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over McClure in view of Yoshida. Applicants respectfully traverse.

Dependent claim 16 was rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Yoshida in view of Hasegawa et al. (U.S. Patent App. Pub. No. 2002/0127405). Applicants respectfully traverse.

Under Federal Circuit guidelines, a dependent claim is allowable if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987).

Thus, as independent claims 1 and 15 are allowable for the reasons set forth above, it is respectfully submitted that dependent claims 2-14 and 16 are allowable for at least the same reasons as their respective base claims.

Moreover, with respect to claim 16, Hasegawa discloses a doping method via ion implantation using S (sulfur) as a dopant, and the temperature dependency of the diamond semiconductor doped with sulfur exhibits a positive correlation with temperature, as shown in Fig. 6 of Hasegawa. Namely, Fig. 6 of Hasegawa clearly shows a positive correlation of carrier

concentration (vertical axis) with respect to temperature (upper lateral axis). It is clear that the correlation described in Hasegawa does not exhibit a negative correlation with temperature as recited in the present claims. Regarding a doping against a diamond semiconductor, only vapor-phase growth can realize the claimed negative correlation with temperature, as described in paragraph [0039] of the specification.

In instances where a doping method using ion implantation is carried out against Si (silicon) or SiC (silicon carbide), and a doping method using vapor-phase growth is carried out against Si or SiC, it might, for the sake of argument, be possible that both doping methods can realize the same property. However, the properties of the diamond material impurity-doped by using ion implantation is different from those of the diamond material impurity-doped by using vapor-phase growth. Namely, in the ion implantation against Si or SiC, there is a way for effectively restoring irradiation damages caused in Si or SiC crystal by the ion implantation, but in the case of diamond material in which irradiation damages caused therein by ion implantation, it is difficult to restore the damage, as described in paragraph [0005] of this specification.

Accordingly, it is urged that the application, as now amended, is in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, Examiner is requested to call the undersigned attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

Brian K. Seidleck
Registration No. 51,321

600 13th Street, N.W.
Washington, DC 20005-3096
Phone: 202.756.8000 BKS:idw
Facsimile: 202.756.8087
Date: December 9, 2008

Please recognize our Customer No. 20277 as our correspondence address.